Myrcia paganii

5-Year Review:
Summary and Evaluation

Picture by: Jonathan Flickinger

U.S. Fish and Wildlife Service
South Atlantic-Gulf Region
Caribbean Ecological Services Field Office
Boquerón, Puerto Rico

May 2022

STATUS REVIEW

Myrcia paganii (no common name)

GENERAL INFORMATION

Current Classification: Endangered

Lead Field Office: José Martinez and Marielle Peschiera, Caribbean Ecological Services Field Office,Boquerón, Puerto Rico. (786) 244-0081.

Reviewers:

Lead Regional Office: South Atlantic-Gulf and Mississippi Basin Region, Atlanta, GA, Carrie Straight (404) 679-7226

Date of original listing: February 18, 1994 (59 FR 8138)

Methodology used to complete the review: In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants (50 CFR 424.11). The U.S. Fish and Wildlife Service (Service) evaluated the biology, habitat, and threats of the *Myrcia paganii* to inform this status review. On July 14, 2021, the Service published a noticein the *Federal Register* (86 FR 37178) announcing the 5-year status review for 37 species including *Myrcia paganii*. It requested new information and comments from species experts and biologists familiar with this threatened plant concerning its ecology and status. No comments were received. This review was prepared by a Service biologist, and it summarizes information that the Service has compiled for *Myrcia paganii*.

Federal Register Notice Citation Announcing Initiation of this Review
July 14, 2021; 86 FR 37178

Species' Recovery Priority Number at start of review (48 FR 43098): 8. At the time of listing, *Myrcia paganii* was recognized as a species with a moderate degree of threat and a high recovery.

Review History: The previous 5-year status review written in 2016 recommended no change in status and, therefore, that the species should be remain classified as an endangered species (Service 2016).

REVIEW ANALYSIS

Listed Entity

Taxonomy and nomenclature:
Myrcia paganii was traditionally included in the genus *Myrcia* within the family Myrtaceae. In the 1880s *M. paganii* was described from a sterile collection obtained in northern Puerto Rico and placed under the genus *Myrcia* (Little et al. 1974). Nevertheless, a recent collected fertile material showed that based on the morphology of the species' reproductive organs (protruding placenta bearing multiple ovules), *M. paganii* falls within the genus of *Pimenta* and not *Myrcia* (Flickinger et al. 2020). However, for the purposes of this document, we will continue using the name *M. paganii* as it was published at the time of listing.

Distinct Population Segment (DPS):
The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listing of a DPS to only vertebrate species. Because the species under review is a not a vertebrate, the DPS policy does not apply.

Recovery Criteria

Recovery Plan
The species has an approved recovery plan (Service 1997), which establishes delisting as the recovery objective for *M. paganii*. However, the plan does not contain measurable recovery criteria for delisting. The plan neither defines the number of individuals needed for a self-perpetuating population.

The recovery plan specifies that *Myrcia paganii* could be considered for delisting when:

1. Populations on privately owned land areas are placed under protective status.

2. New populations (the number of which should be determined following the appropriate studies) of the species, capable of self-perpetuation, have been established within protected areas such as the Guajataca Commonwealth Forest, the Cambalache Commonwealth Forest, or the Río Abajo Commonwealth Forest.

Criterion 1 has been partially met. As stated on the 2016 5-year status review, some individuals of *M. paganii* are found on private properties managed for conservation (i.e., El Tallonal and Mata de Plátano in the municipality of Arecibo). However, other populations are located within private properties with no protection. Recently, the NGO Para La Naturaleza (PLN) purchased land in the municipality of Hatillo where one individual of *M. paganii* was found. PLN is also looking to acquire another property between the municipalities of Camuy and Quebradillas, where two *M. paganii* individuals were documented.

Criterion 2 has not been met. No new populations have been established. The species has not been documented in reproductive stage and no propagation technique has been developed.

Biology and Habitat Summary

Myrcia paganii is a rare and small evergreen tree of the Myrtaceae family, endemic to Puerto Rico, which grows up to 20 m (65.6 ft) in height (Little et al. 1974, Liogier 1994). The species was known to be endemic to the northwestern karst region (subtropical moist forest; Ewel and Whitmore 1973) of Puerto Rico. The core known population within the northern karst region of Puerto Rico highlights the importance of the karst habitat for the species. However, it is noteworthy the record of the species within the Toro Negro Commonwealth Forest (subtropical wet forest; Ewel and Whitmore 1973) in the Cordillera Central (central mountain range) of Puerto Rico. This represents the first record of the species occurring on volcanic derived soils. As stated in the 2016 5-year status review, a total of 103 *M. paganii* individuals were documented during a 2002-2006 study (Trejo-Torres et al. 2011). From these individuals, 94 were found within the northern karst region of Puerto Rico: Guajataca Commonwealth Forest (50 individuals), the private natural reservesof Mata de Plátano and El Tallonal (22 individuals), Biáfara sector, Arecibo (18 individuals), and Piedra Gorda Ward, Plazuela sector in Camuy (4 individuals) (Figure 1). Nine other individuals were found in 2006 by M. Caraballo (University of Puerto Rico, Río Piedras) in the Toro Negro Commonwealth Forest (Trejo-Torres *et al*. 2011). Additionally, José Sustache mentioned finding an individual in Quebradillas, on the route of the once proposed Highway PR-22 and 19 individuals (including adults and juveniles) at El Tallonal, but he stated those could be the same individuals reported by Trejo-Torres et al. (2011) (J. Sustache, Puerto Rico Department of Natural and Environmental Resources (PRDNER), 2022 pers. comm.)

Recently, three additional *M. paganii* individuals were found in the northern karst region, in two new locations. Two individuals in the municipality of Hatillo within a property acquired by PLN for conservation, and another in a private property between the municipality of Camuy and Quebradillas (Monzón, PLN, 2022, pers. comm.) (Figure 1). These occurrences raised the number of known localities but does not substantially change the spatial distribution of the species. The known occurrences are still isolated from one another and are separated by areas of unsuitable habitat that limits seed or pollen dispersal and genetic exchange.

There has been limited evidence of natural recruitment in many of these populations in the past. None of these populations have been recently monitored. Therefore, population parameters like demographic trends, survival, and phenology are unknown for the species.

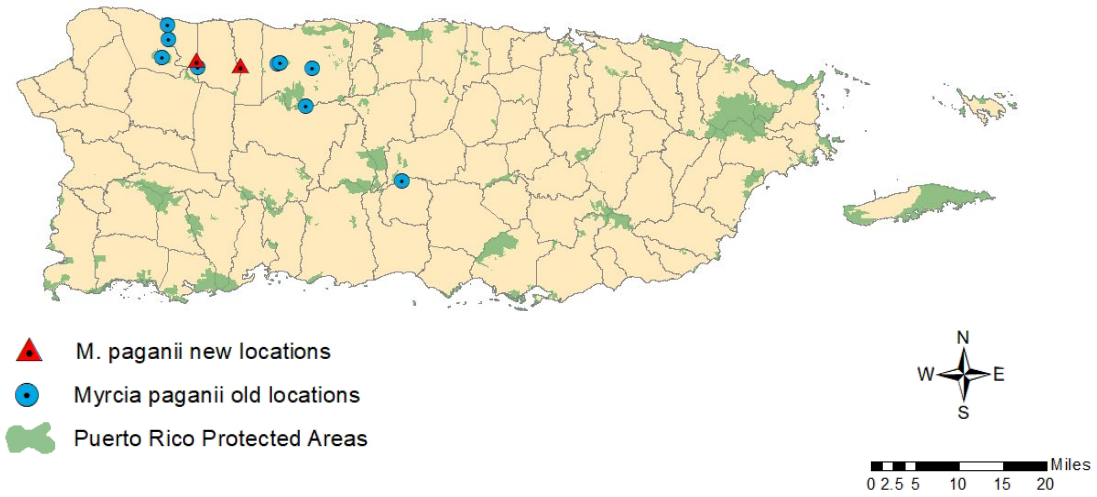

Figure 1. Reported localities of *Myrcia paganii* in Puerto Rico.

Threats (Five-Factor Analysis) Summary

A detailed review of the species' threats can be found in the 2016 5-year status review (Service 2016; pages 8-10). The status of a species is determined from an assessment of factors specified in section 4 (a)(1) of the Act, including:

Factor A (the present or threatened destruction, modification, or curtailment of its habitat or range).
Factor B (overutilization for commercial, recreational, scientific, or educational purposes).
Factor C (disease or predation).
Factor D (the inadequacy of existing regulatory mechanisms).
Factor E (other natural or manmade factors affecting its continued existence).

A summary of this assessment is detailed below. Habitat destruction and modification remains one of the primary factors negatively affecting *M. paganii. Myrcia paganii* is still known to occur on both privately-owned land and on land managed for conservation. Individuals on protected lands are less likely to be impacted by this threat. However, individuals on privately-owned lands are a concern to the Service as modification of habitat can occur at any time.

As stated in the 2016 5-year status review, the Service conducted a consultation under section 7 of the Act with the Puerto Rico Highway and Transportation Authority (PRHTA) for the expansion of the current PR-22 highway from the municipality of Hatillo to the municipality of Aguadilla. As explained back then, one of the proposed alignments of this project could affect *M. paganii* populations and habitat at *La Cara del Indio* area in Isabela. The Service worked with PRHTA and PRDNER to develop alternatives and establish conservation measure to avoid impact to *M. paganii* individuals but has paused since 2019.

Another development project mentioned in the previous 5-year status review is the single-family housing units "Senderos de Miraflores". This project has been on hold since 2009 and no new information has been received on the continuation of the project.

Currently, although no specific projects are known within the species current occupancy, the populations at private properties in the karst region may continue to be subject to habitat modification activities, such as urban development. Habitat is also likely to be impacted by the effects of hurricanes, which is discussed further under a discussion of climate change, Factor E, below.

The laws and regulations that currently protect the species are detailed in the 2016 5-year review (Service 2016). The enforcement of laws and regulations on private lands continues to be a challenge as accidental damage or extirpation of individuals has occurred with other federally listed species due to lack of knowledge of the species by private landowners and law enforcement officers. Although the species is still protected under the same laws and regulations stated in the 2016 5-year status review, the individuals located in private property continue to be exposed and subjected to impacts associated to habitat modification activities, such as urban development, habitat fragmentation and habitat edge conditions.

In addition to the information in the 2016 review, the Commonwealth of Puerto Rico Law No. 292-1999, also known as Puerto Rico Karst Physiographic Protection and Conservation Law (Ley para la Protección y Conservación de la Fisiografía Cársica de Puerto Rico), regulates the extraction of rock and gravel for commercial purposes, and prohibits the cutting of native and endemic vegetation in violation of other laws (e.g., Law No. 241–1999 and Regulation 6766) in both northern and southern karst regions of Puerto Rico. This law has the potential to provide some protections to the species for individuals that are aware of the law and are conducted lawfully.

Other natural or manmade factors such as hurricanes, climate change, low genetic diversity and low recruitment are a threat to the species.

Hurricanes. As a species endemic to the Greater Antilles, *M. paganii* should be adapted to tropical storms disturbance. However, the low number of populations and individuals pose a threat to the species by making it susceptible to stochastic events such as hurricanes. In September 2017, Puerto Rico received the impact of two catastrophic hurricanes (Irma and María) (Pérez et al. 2021). Both events produced extensive damage across Puerto Rico and to the habitat and forest structure. Because of the hurricane Maria's track passing directly over Puerto Rico, the whole island was impacted in some way by the hurricane. It is estimated that Hurricane María killed or severely damaged over 20 million trees throughout Puerto Rico (Feng et al. 2018). In addition, the rainfall associated to hurricane María was estimated within a range between 254 - 381 mm (10-15 inches) (Pasch et al. 2019). Although the species evolved being adapted to hurricanes and tropical storms, the increasing number and intensity of hurricanes may exceed the species' ability to persist.

Climate Change. Vulnerability to climate change impacts is a function of sensitivity and exposure to those changes, and the adaptive capacity of the species (Glick et al. 2011). Populations of *M. paganii* may be displaced or outcompeted by native or exotic species with

wider environmental plasticity. Climate change may also compromise natural recruitment by affecting seed germination and/or the survival of seedlings. Nonetheless, at present there is no information regarding the competitive abilities of *M. paganii* nor its seed germination capability and survival. Modelling predicts that extreme weather events, including extreme hurricanes like those seen in 2017, and changes in overall weather patterns (e.g., decreases in mean precipitation and increases in heat) are likely to continue (Intergovernmental Panel on Climate Change [IPCC] 2021).

Biological Factors Increasing Threat Risk to Species. Given the very small numbers of individuals reported in wild populations of *M. paganii*, it is highly likely that its genetic variability is very low. This would result in a loss of alleles by random genetic drift (Honnay and Jacquemyn 2007), which would limit the species' ability to respond to a changing environment (Booy et al. 2000). The reproductive biology of *M. paganii* is unknown, and we believe that the small and isolated populations may be affected by lack of natural recruitment. Many Myrtaceae flower sporadically and for very short periods of time. If the species is self-incompatible (not able to self-pollinate), its sexual reproduction would be severely limited. Thus, we consider the reproductive biology of the species and the small size of populations as threats to the species.

Due to species limited distribution, low number of individuals and small population size the species continue to be vulnerable to natural and stochastic events, such as hurricanes. Additionally, due to the low number of individuals, it is expected that the species has low genetic variability, this could exacerbate the species ability to adapt to changing environmental conditions. Moreover, the lack of evidence of recruitment, the observation of isolated populations and apparent lack of the species ability to self-pollinate, could influence species ability to reproduce, and therefore, hinder its survival. Therefore, the Service considered this factor as a high threat to the species.

Synthesis

Myrcia paganii is a small and rare evergreen tree of the Myrtaceae family, endemic to Puerto Rico. This species is still mostly known to occur in the northern karst of region of Puerto Rico where, as of 2016 5-year status review, 94 individuals were found individually or in small isolated clusters in the northwest portion of the Island. Another 19 individuals were reported at El Tallonal in the municipality of Arecibo in northern Puerto Rico, but those individuals are suspected to be the same as the ones accounted for in 2011. Additional to these northern karst region individuals, nine individuals are found in Toro Negro Commonwealth Forest, the only record of the species in volcanic derive soils. None of these populations are being monitored, and their current status is unknown. There has been limited evidence of natural recruitment of the species in the past and there are still significant concerns related to the species viability at many of these locations. Recently, three new individuals were found within the northern karst region. Based on the information currently available to us, a total of 107 individuals (not counting the 19 individuals found at El Tallonal) of *M. paganii* are known to occur in 10 sites, two additional sites than the ones reported in 2016 5-year status review.

The species is still subject to habitat destruction or modification on private properties in northern karst of Puerto Rico and at all locations related to development. Natural factors such as hurricanes, climate change, genetic variation, phenology, and breeding system are also considered substantial threats to *M. paganii*. These threats are exacerbated by the low number of known *M. paganii* individuals and species' limited distribution and recruitment. Therefore, the Service believes that *M. paganii* stills meet the definition of an endangered species.

RESULTS

U.S. FISH AND WILDLIFE SERVICE
STATUS REVIEW of *Myrcia Paganii*

Status Recommendation:

On the basis of this review, we recommend the following status for this species. A 5-year review presents a recommendation of the species status. Any change to the status requires a separate rulemaking process that includes public review and comment, as defined in the Act.

____ Downlist to Threatened
____ Delist *(Indicate reasons for delisting per 50 CFR 424.11)*:
__ _ *The species is extinct*
____ *The species does not meet the definition of an endangered or threatened species.*
____ *The listed entity does not meet the statutory definition of a species.*
_X__ No change needed, species remains listed as endangered

FIELD OFFICE APPROVAL:

Field Supervisor, Caribbean Ecological Services Field Office, Fish and Wildlife Service

Approve EDWIN MUNIZ Digitally signed by EDWIN MUNIZ Date: 2022.05.17 14:35:14 -04'00' Date _____
* Since 2014, Southeast Region Field Supervisors have been delegated authority to approve 5-year reviews that do not recommend a status change.

RECOMMENDATIONS FOR ACTIVITIES

Recommendations included in the 2016 5-years status review still apply. Additionally, we included the following recommendations.

1. Evaluate the feasibility for the long-term conservation of seed material (seed banking). Due to the lack of natural recruitment in the wild, *ex situ* conservation efforts should be considered a priority for *Myrcia paganii*.

2. Studies should be conducted to determine the patterns of genetic variation within and among populations to develop a plan to preserve the species genetic variability and to manage populations effectively.

3. Further studies should be conducted on the species reproductive biology to address other limiting factors (e.g., lack of pollinators or seed dispersers).

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